



Part 4: Financing Options

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Landfill Methane Outreach Program (LMOP)

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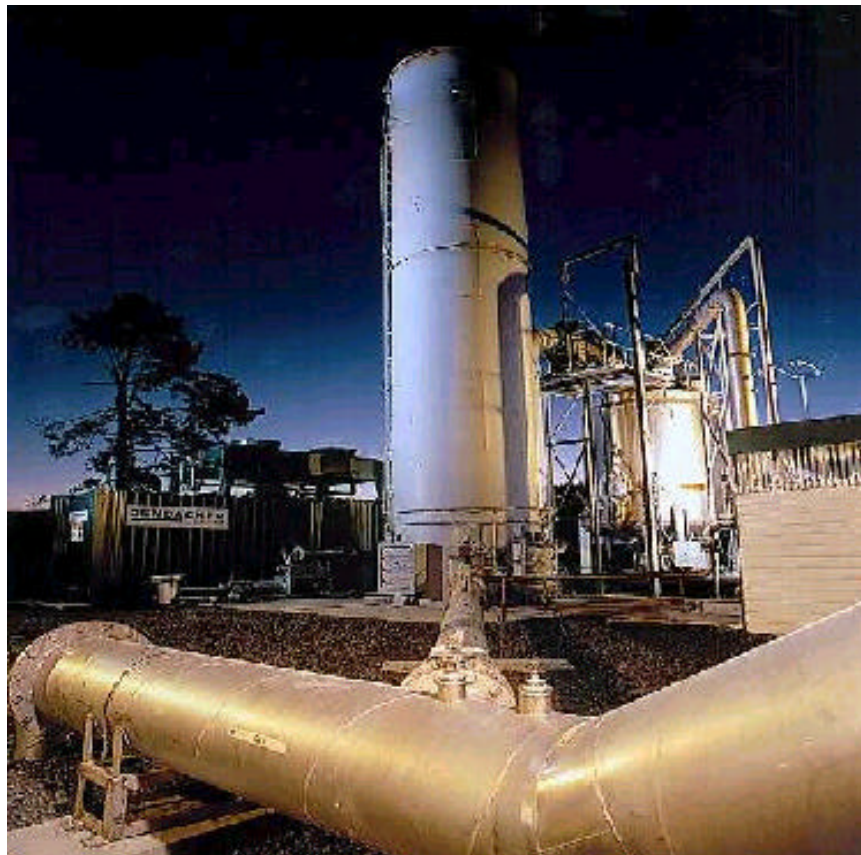
Training Workshop

Sao Paulo, Brazil

Outline



- **Introduction**
- **Financing Considerations**
- **Project Costs**
- **Project Revenues**
- **Project Financing**
- **Risk Management**
- **Summary**



Introduction



- **Ideally, Landfill gas projects should be economically sustainable**
- **Landfill gas projects may require investment or funding support from third parties**
- **Landfill gas projects have an additional benefit... consideration of “non-price” factors such as environmental benefits to justify project economics**

Financing Considerations



- **Landfill gas project financing considerations**
 - **Planning Period**
 - **Financial Assessment Criteria**
 - **Project Quantities**



Planning Period



- **15-years is typical for landfill gas projects**
- **Shorter planning period for small and closed landfills**
- **Longer planning period for larger operational sites**

Financial Assessment Criteria



- **Three main techniques for determining economic feasibility of LFGTE projects**
 - **Payback Method**
 - **Discounted Cash Flow Method (NPV)**
 - **Internal Rate of Return Method (IRR)**
- **Sensitivity analyses should be carried out to examine impacts of changes in project conditions**



Project Quantities

- **Establish project quantities on an annual basis by looking at**
 - **Landfill Gas Recovery Rate**
 - ◆ Estimate rate annually
 - ◆ Estimate rate over the life of the project
 - **Landfill Gas Utilization Rate**
 - ◆ Estimate annually and over the life of the project
 - ◆ Plant capacity
 - ◆ On-line availability



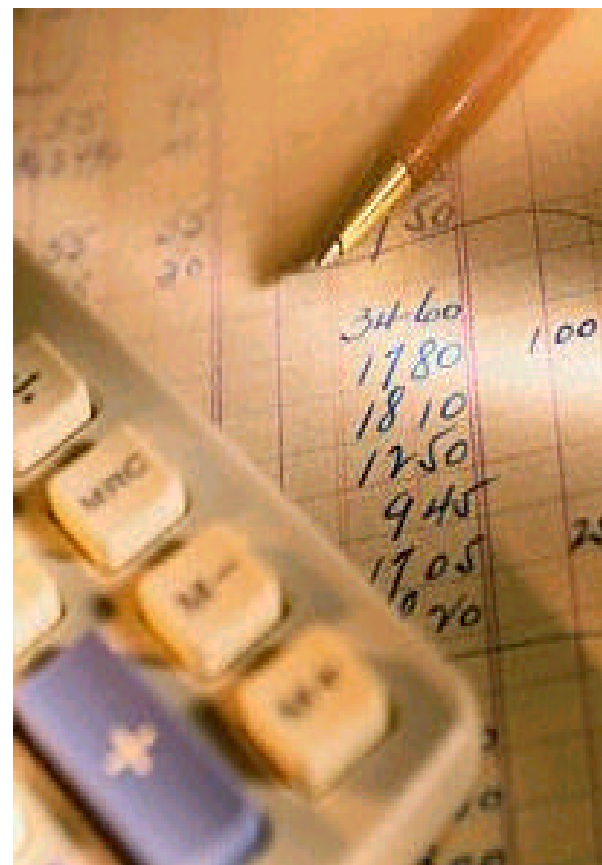
Project Quantities

- **Project Quantities can also be determined by**
 - **Emission Reductions**
 - ◆ **Can be calculated annually and over the life of the project**
 - ❖ **LFG utilization**
 - ❖ **LFG flaring**
 - ❖ **Report in terms of CO₂ or CO₂ equivalent**
 - **Carbon Abatement**
 - ◆ **Calculate additional emission reductions benefits from the LFGTE project due to displacement of fossil fuels**
 - ❖ **Oil**
 - ❖ **Natural gas**
 - ❖ **Coal**

Project Costs



- **Capital costs**
 - Landfill Improvements
 - LFG Collection System
 - LFG Utilization System
- **Operation and Maintenance Costs**
- **Other Project Costs**
 - Permitting Fees
 - Consultants



Landfill Improvements

- **Additional financial resources may be required to improve a landfill before a landfill gas project can proceed**
 - **Revising waste placement practices**
 - **Installing landfill capping**
 - **Improving storm water control**
 - **Controlling and managing leachate**
 - **Increasing slope stability**
 - **Providing adequate site access**

LFG Collection/Control System



- **Capital costs may include:**
 - Vertical extraction wells
 - Horizontal collectors
 - Other collection points
 - Laterals and headers
 - Condensate system
 - Blower/flare station
 - Monitoring system
- **Labor and other direct costs associated with operating and maintaining the LFG recovery system (typically approximately 10% of LFG system capital cost on an annual basis)**



LFG Utilization System



- **Capital costs may include**
 - Power plant
 - Electrical interconnect
 - Pipeline
 - Equipment conversion
 - Utilities (water, sewer)
 - Offices
 - Equipment storage
 - Maintenance areas
- **Labor and other direct costs associated with operating and maintaining the system**
- **Costs depend on utilization option and equipment selected**



Other Project Costs

- **Other project costs may include**
 - **System design**
 - **Legal**
 - **Royalty payments**
 - **Financing**

Project Revenues

- **Energy Sales**
 - Plant capacity
 - Plant on-line availability
 - Energy price/contract
- **Incentive Programs**
 - Tax credits
 - Incentives that promote development of renewable energy sources
 - Grants/Loans
- **Emission Reduction Credits**
 - Additional revenue possible if an international market for emission reduction credits emerges

Project Financing



- **Local Financing**
 - **Partnering with Local Organizations**
 - **In-Country Assistance**
- **International Financing Organizations**

Local Financing

- **Financing for landfill gas projects may be able available through:**
 - **Local Organizations**
 - **Municipalities**
 - **Private Companies**
 - **Lending Institutions**
- **In-country assistance programs supporting**
 - **Energy Policy**
 - **Environmental Protection**
 - **Development of New Technologies**

International Financing



- **Financing may also be able available from International organizations including:**

- **World Bank**
- **Multilateral Development Banks**
- **U.S. Government Agency Programs**
- **U.S. Initiative on Joint Implementation**
- **United Nations**





How To Obtain Funding

- **Review types of assistance available**
 - **Grants**
 - **Loans**
 - **Loan Guarantees**
 - **Venture Capital Funds**
 - **Business Consulting Services**
- **Identify Funding Requirements**
 - **Program Objectives**
 - **Resource Allocation**
- **Select Sources of Funding**

Project Risks: Technical

- **Main Risk:**

- Quantity of organic waste
- Landfill stability
- Recovery of methane
- Performance of the utilization system

- **Mitigation Measures:**

- Focus on larger landfills
- Assessment and analysis
- Verify Landfill gas recovery rates
- Use of proven technologies

Project Risks: Financial

- **Main
Risk:**

- **Project revenue shortfall**
- **Availability of funding**
- **Project implementation and operation**

- **Mitigation
Measures:**

- **Obtain a long-term energy contract**
- **Involve project stakeholders**
- **Obtain technical support and training**

Summary



- **Landfill gas projects can provide a cost-effective means of controlling methane emissions from landfills**
- **Project revenue is primarily derived from the sale of the recovered energy**
- **May earn additional revenue from incentive programs or emission reduction credits**

Summary, continued...

- **A sound project development strategy is important and should include**
 - **Capital costs**
 - **Potential revenue; and**
 - **Identification and mitigation of technical and financial risks**
- **A number of options may be available for additional project financing**
 - **Think creatively**
 - **Apply for assistance**